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PROPRIETARY

ENERGY/ARCTIC
BACKGROUND PAPER

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Imperial Oil Limited

July, 1973

CHAPTER 1: THE ISSUES

Petroleum shortages of petroleum fuels in the United States have caused many Canadians to become concerned about the energy supply in our own country. At the same time, exploration activities in Canada's frontier areas — the Arctic and the eastern continental shelf — have created an additional set of concerns about the effects that development and exploiting of these potential new reserves will have upon the Canadian economy, upon the environment and upon the life styles of northern native people.

Some segments of our society, including petroleum companies such as Imperial Oil Limited, see the U.S. shortage as an opportunity to develop Canadian resources more economically by exporting some of our Arctic gas and oil to help recover development costs. Others, including groups and individuals from a broad cross-section of society are questioning the advisability of exporting Canadian petroleum supplies. Some even question the advisability of any development of our Arctic resources.

While the questions vary according to the specific interests and geographic locations of the people asking them, they can be grouped into six major areas of concern:

ENERGY/ARCTIC

BACKGROUND PAPER

1. The advisability of developing Arctic resources at this time is questioned because alternative sources of supply seem to be available to meet Canadian needs.
2. The advisability of exporting Canadian oil and gas is questioned because the U.S. experience seems to pose a warning that we, too, may eventually run short of energy supplies for our own use.
3. The possible economic impacts of such development are coming under scrutiny, including:

the effects on the amount of capital available for expansion of secondary manufacturing industries if large amounts of additional capital are invested in primary resource development;

the long term employment contributions of "capital-intensive" resource development projects;

effects on the exchange rate of the Canadian dollar as a result of large imports of capital and subsequent large exports of oil and gas;

the degree of participation by Canadian suppliers and workers in large energy development projects.

CHAPTER 1: THE ISSUES

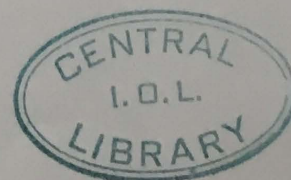
Recent shortages of petroleum fuels in the United States have caused many Canadians to become concerned about the energy supply in our own country. At the same time, exploration activities in Canada's frontier areas -- the Arctic and the eastern continental shelf -- have created an additional set of concerns about the effects that development and marketing of these potential new reserves will have upon the Canadian economy, upon the environment and upon the life styles of northern native people.

Some segments of our society, including petroleum companies such as Imperial Oil Limited, see the U.S. shortage as an opportunity to develop Canadian resources more economically by exporting some of our Arctic gas and oil to help recover development costs. Others, including groups and individuals from a broad cross-section of society, are questioning the advisability of exporting Canadian petroleum supplies. Some even question the advisability of any development of our Arctic resources.

While the questions vary according to the specific interests and geographic locations of the people asking them, they can be classified loosely into six major areas of concern:

1. *The advisability of developing Canadian Arctic reserves at this time is questioned because alternative sources of supply seem to be available to meet Canadian needs.*
2. *The advisability of exporting Canadian oil and gas is questioned because the U.S. experience seems to pose a warning that we, too, may eventually run short of energy supplies for our own use.*
3. *The possible economic impacts of such development are coming under scrutiny, including:*
 - *the effects on the amount of capital available for expansion of secondary manufacturing industries if large amounts of additional capital are invested in primary resource development;*
 - *the long term employment contributions of "capital-intensive" resource development projects;*
 - *effects on the exchange rate of the Canadian dollar as a result of large imports of capital and subsequent large exports of oil and gas;*
 - *the degree of participation by Canadian suppliers and workers in large energy development projects.*

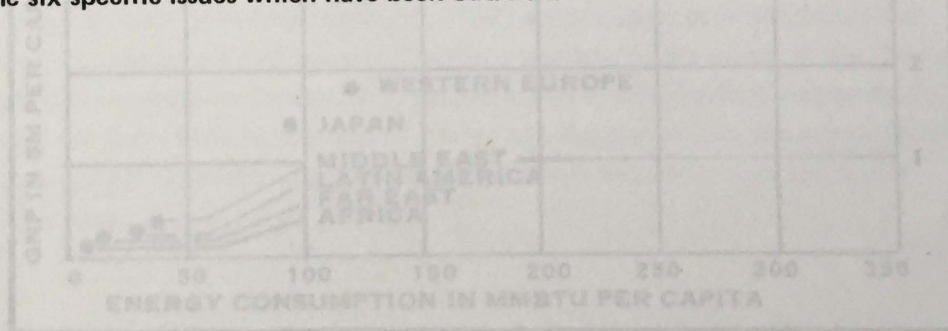
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CHAPTER 2: THE ECONOMIC IMPORTANCE OF ENERGY

4. *There is a belief among some people that foreign-owned, multinational corporations export an undue amount of profits in relation to the economic benefits they generate for a country, and that government regulation of Arctic development is too favourable to these companies.*
5. *There is a desire for assurance that environmental protection research, standards and techniques are adequate to minimize the effects of development on the Arctic's delicate ecological balance.*
6. *There is concern about the effects of Arctic resource development upon the economic and social patterns of northern native people.*

These basic issues are quite properly the concern of our country's citizens and their elected representatives at all levels of government. It is our responsibility to bring to the public debate a full examination of the facts and a reasoned, logical explanation of Imperial Oil's position on these issues. This paper will help you to acquire a general background knowledge of the world energy situation and Canada's position in it. The United States' position in the world energy situation presents an opportunity for Canada to develop its energy resources and improve its economy by expanding trade with the U.S. A careful selection of economic and other policies will be required to accomplish these goals. Chapters 2 through 5 provide background on the world, Canadian and U.S. energy positions. Chapters 6 through 11 relate this information to the six specific issues which have been outlined.



It can be seen that the industrially advanced nations, with a higher GNP per capita, consume far more energy per capita than the underdeveloped nations of Africa, the Far East and Latin America.

CHAPTER 2: THE ECONOMIC IMPORTANCE OF ENERGY

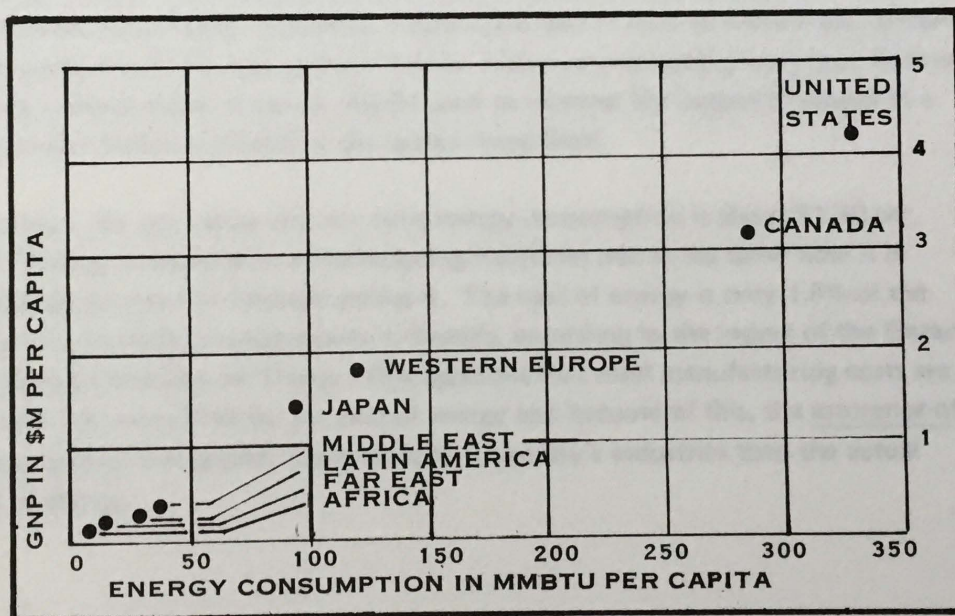
Energy provides the means for improving productivity and this results in increased income levels. In turn, this creates non-industrial demands for additional energy as fuel for the consumer products which are associated with a higher standard of living. The demand for energy in all forms has increased dramatically since World War II and there is little to suggest that demand will not continue to grow substantially.

Energy/Wealth Relationship

The following chart illustrates the correlation between energy consumption and standard of living (measured in Gross National Product per capita) in various countries:

FIGURE 1

ENERGY AND NATIONAL LIVING STANDARDS



It can be seen that the industrially advanced nations, with a higher GNP per capita, consume far more energy per capita than the underdeveloped nations of Africa, the Far East and Latin America.

Since World War II, Canada's real Gross National Product has increased at an average annual rate of 4.7% while energy consumption has increased at about the same rate -- 4.6%. In the United States, the comparable figures are both about 4.4%. In Japan, where post war economic expansion has led the world, output of real goods has increased by 9% annually while energy consumption has increased at an annual rate of 12%.

The Cost of Energy

A single barrel of crude oil contains 6 million BTU's of energy potential. This is equivalent to 24 man-years of manual labour. (One man working eight hours per day for 250 days will generate about 250,000 BTU's of energy). At current prices unrefined crude oil supplies energy at a cost of about 17 cents per man-year. At \$4.00 per barrel, crude oil is purchased for 11½ cents per gallon, or just over 1½ cents per pound -- a relatively low cost when compared with almost any other marketable commodity. Similarly, 1,000 cubic feet (1 mcf) of natural gas contains the equivalent of four man-years of labour with a corresponding low cost. Because energy is inexpensive, it can be readily used to increase the output of labour at a rate greater than the growth of the labour force itself.

In Canada, the per capita cost for total energy consumption is about \$1.10 per day. Energy is essential to manufacturing industries and at the same time it is a small component of finished products. The cost of energy is only 1.9% of the value of manufacturing shipments in Canada, according to the report of the Ontario Advisory Committee on Energy. It is apparent that total manufacturing costs are affected relatively little by the cost of energy and because of this, the assurance of energy supply is of greater importance to a country's industries than the actual cost of energy.

NOTE

The following chapters (3 through 6) contain forecasts of energy demand and estimates of energy supply.

It is difficult to project figures such as these. Past experience plays an important part in forecasting, but in the past, supplies of conventional energy have been virtually unrestricted and prices have been relatively low and stable. In the future, there will be many variables which are untested and which will likely affect both demand and supply. Higher prices for energy will likely affect the demand for specific forms of energy. The effect of higher prices on overall energy usage can only be judged intuitively. Technological progress affecting supply can be assumed, but the pace of progress in releasing new energy forms is difficult to predict.

Despite these uncertainties, forecasts are useful and should be made. For our purposes, we can use the recent past to guide us. The projections which follow are heavily influenced by such known factors as current rates of addition to energy reserves, present markets for energy and the present state of energy technologies.

CHAPTER 3: WORLD ENERGY POSITION

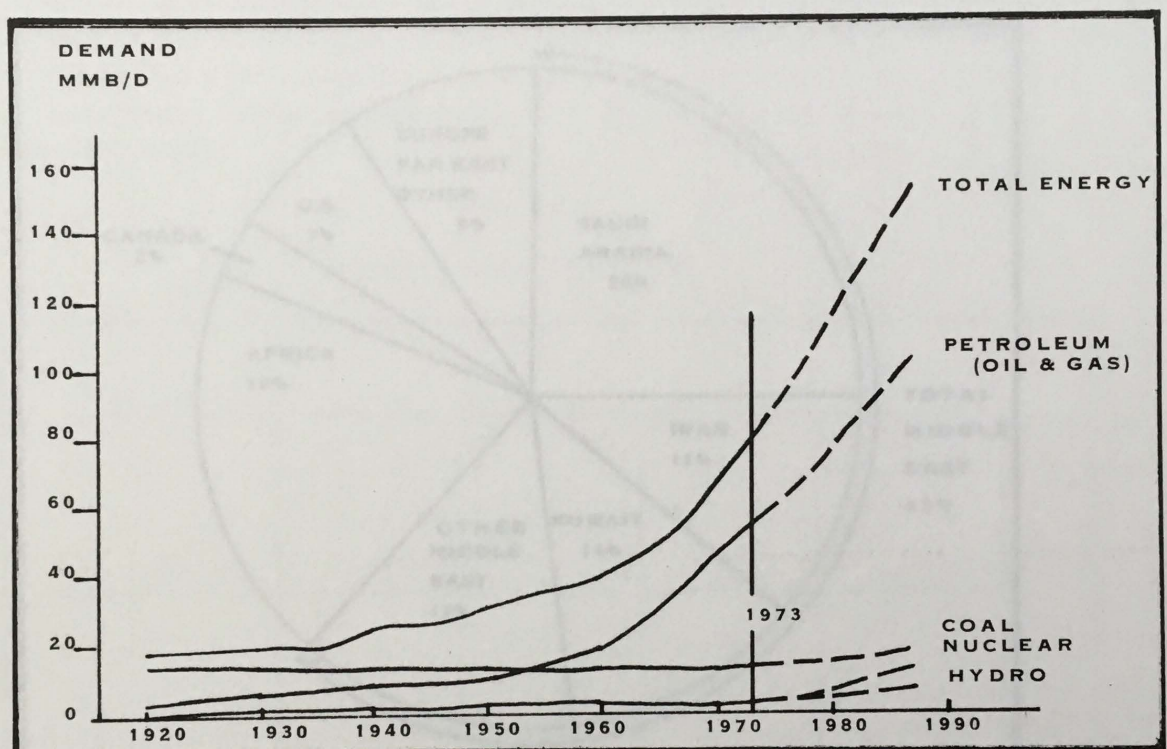
ENERGY DEMAND

The consumption of all forms of energy is growing at a rate which will place increasingly heavy demands on available supplies:

CHAPTER 2

FREE WORLD ENERGY DEMAND

(BASED ON PROJECTIONS FROM RECENT HISTORY)

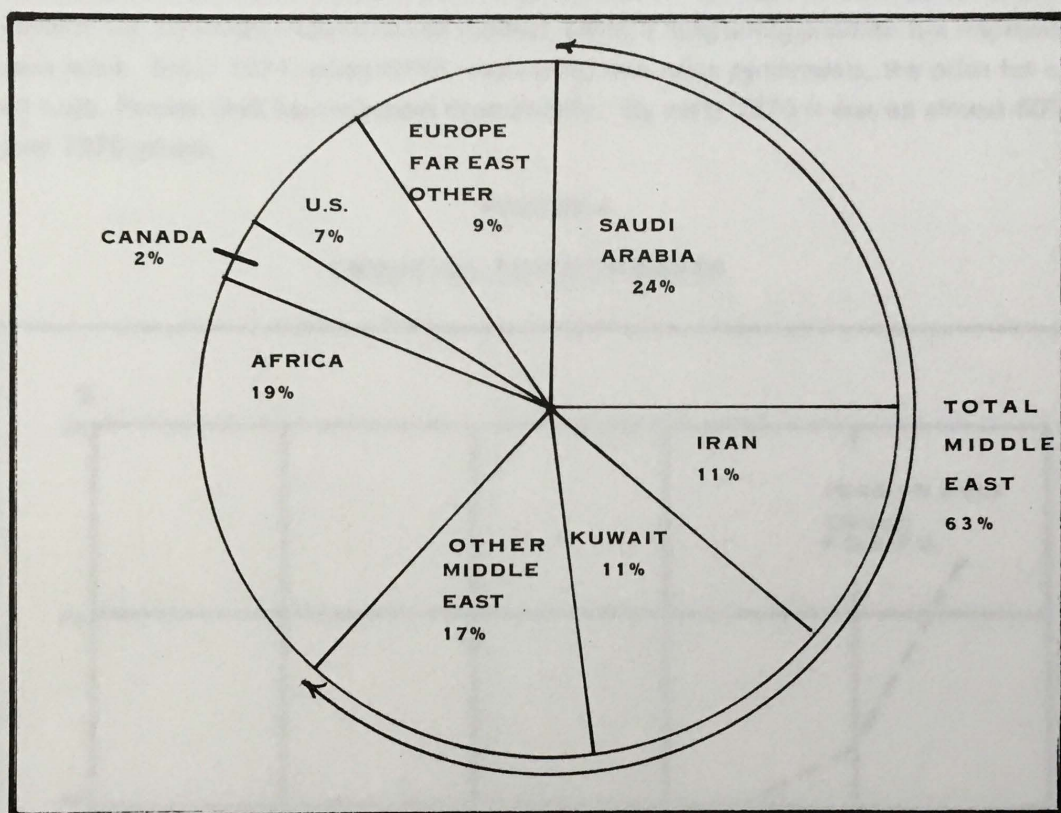


The above chart shows that petroleum fuels are by far the most popular form of energy, and will remain so for years to come. Because newer energy forms such as nuclear energy have not developed in pace with overall demand, petroleum fuels have filled an increasing portion of the world energy need. Oil and gas together now account for about 70% of free world energy consumption. This percentage will remain the same through 1980, but the crude oil portion will grow from the present 50% of total energy consumption to about 60%. Oil is favoured over other energy forms because of its availability, its relatively high heat content, its clean-burning properties in comparison with such fuels as coal, and its suitability for transportation by ship, pipeline or railway.

Crude Oil Supply

The following chart shows that a large part of the free world reserves of crude oil are located in the Middle East -- nearly one-quarter in Saudi Arabia alone. Another one-fifth of the supply is located in Africa.

FIGURE 3
FREE WORLD KNOWN CRUDE OIL RESERVES



Most industrialized nations depend on imports for their crude oil supplies. Japan is, and will probably continue to be almost totally dependent on imported crude oil. Europe is almost totally dependent on imports and this dependence will be only marginally lessened in the future. The United States now imports about one-quarter of its liquid petroleum supplies (including refined products) and some estimates show U.S. imports rising to over 50% by 1985.

Crude Oil Prices

The consortium known as OPEC (Organization of Petroleum Exporting Countries) is made up of 11 nations; Abu Dhabi, Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia and Venezuela. Because these nations produce the bulk of the world's oil while most industrialized nations are dependent on imports, OPEC has been able to exert strong pressure on prices. During the 1960's, a world-wide surplus of oil production led to depressed prices. But even though the price of Persian Gulf crude dropped 35% in this period (from an average of \$1.75 per barrel to an average of \$1.10 per barrel) OPEC nations were still able to obtain greater revenues from their oil production. They did this by successfully exerting common pressure on oil companies to increase the per-barrel amount paid to governments. Because of the rapidly increasing demand for oil among industrialized nations, OPEC's bargaining position has improved even more. Since 1971, when OPEC negotiated new price agreements, the price for crude oil f.o.b. Persian Gulf has increased dramatically. By early 1973 it was up almost 80% over 1970 values.

FIGURE 4
CRUDE OIL PRICE CHANGES

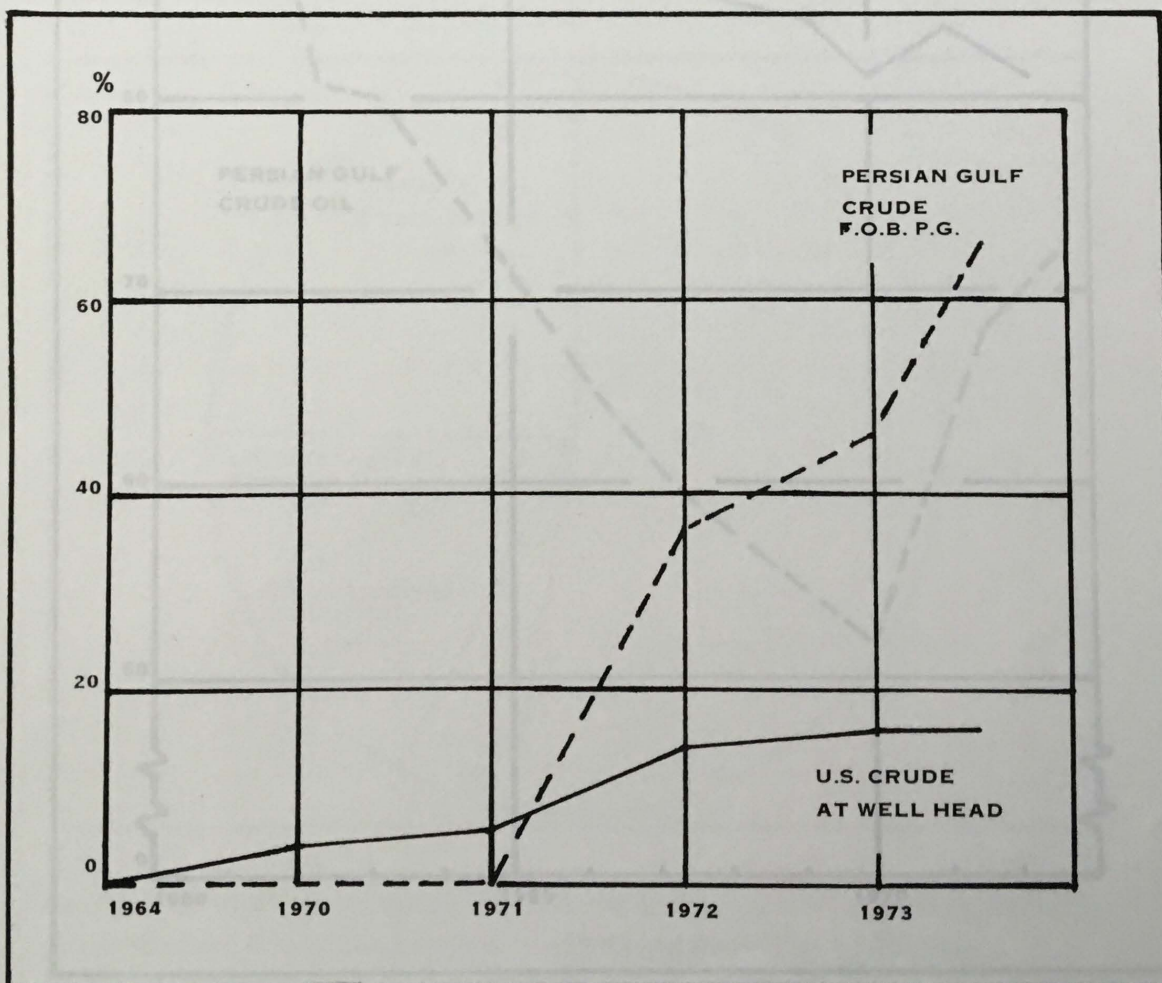
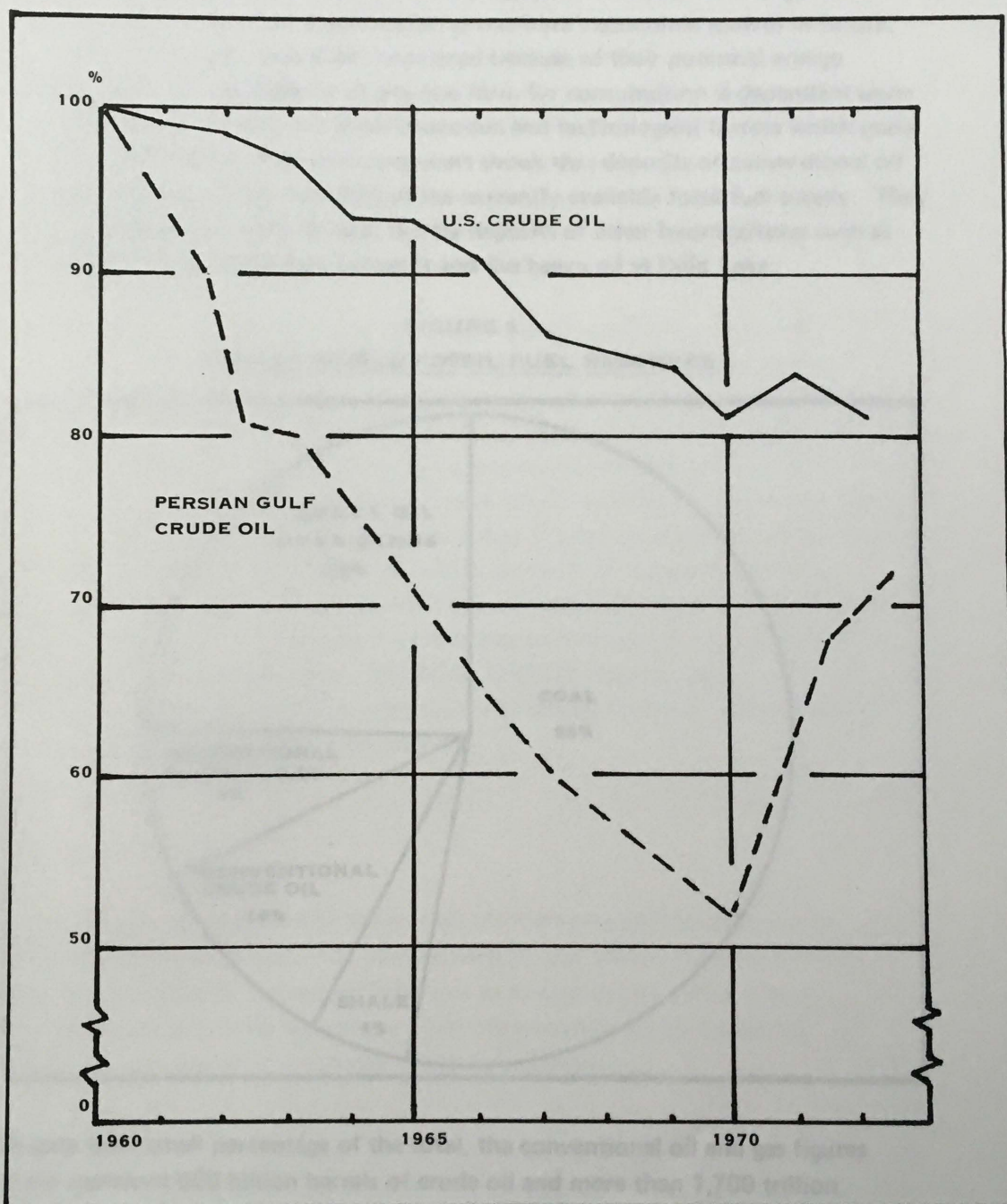


Figure 5 shows that despite recent increases, crude oil prices have not, over the long term, kept pace with inflation. For several years prices as measured in real dollar terms actually declined.

FIGURE 5
CRUDE OIL PRICE CHANGES ADJUSTED FOR INFLATION
(IN 1960 CONSTANT DOLLARS)



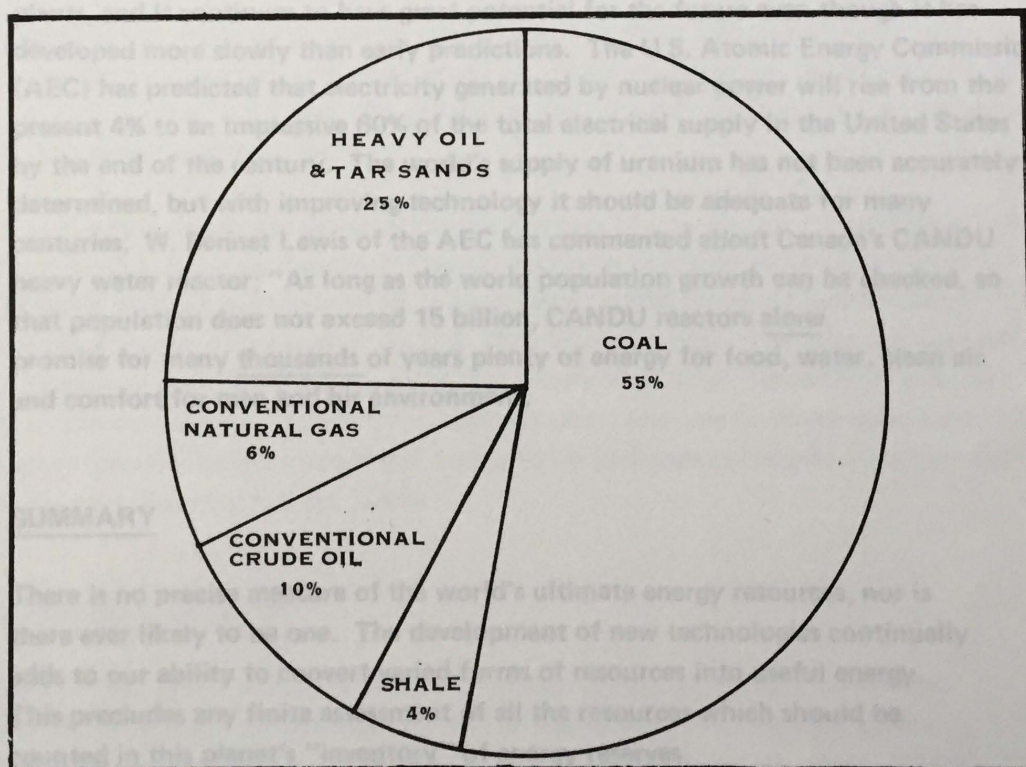
ALTERNATIVES TO OIL & GAS

There are plentiful supplies of fossil fuels throughout the world and technologies are being developed to utilize other forms of fuel on a large scale.

Fossil Fuel Reserves

Reserves of conventional oil and gas have been used at a faster rate than reserves of other fossil fuels because of the desirability and price of these two energy forms. When considering reserves which will serve mankind's economic growth in future, all forms of fossil fuel should be considered because of their potential energy contribution. The availability of any one form for consumption is dependent upon the combination of price and other economic and technological factors which make development feasible. The following chart shows that deposits of conventional oil and gas represent in total just 16% of the currently available fossil fuel supply. They are far surpassed not only by coal, but by deposits of other hydrocarbons such as those found in the Athabasca tar sands and the heavy oil at Cold Lake.

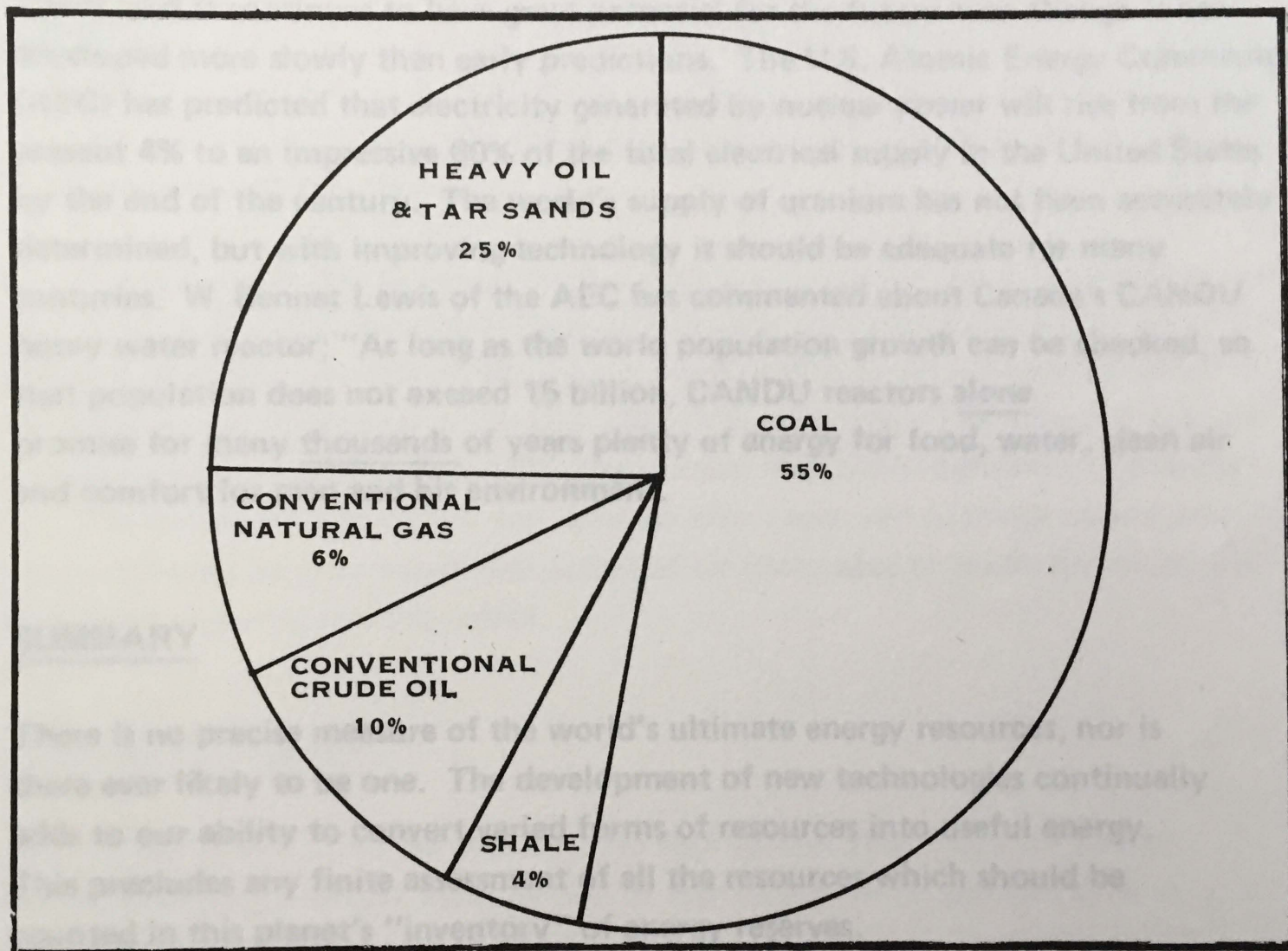
FIGURE 6
PROVEN WORLD FOSSIL FUEL RESERVES



Despite their small percentage of the total, the conventional oil and gas figures above represent 569 billion barrels of crude oil and more than 1,700 trillion cubic feet of natural gas.

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Petroleum Technology

While public attention to "new technologies" is centred on the more inventive endeavours, such as nuclear energy, geothermal energy and even solar energy, it tends to overlook the evolving technology which will permit the conversion of large supplies of fossil fuels which do not exist as conventional oil or gas deposits. Coal, bitumen and heavy oil can be converted to synthetic crude, and all can be converted to natural gas. Canada is in a favourable position in this respect because of the Athabasca tar sands, the Cold Lake heavy oil deposits and our large coal reserves. The extent to which these resources are utilized will depend to a great degree on the success of continuing technological development and on price levels which make conversion economically attractive. The availability of lower priced conventional oil in the past decade has been a major factor in restricting development of these deposits.

Nuclear Technology

Nuclear technology has advanced to the point where nuclear energy is now competitive with fossil fuels in some applications such as thermal generating plants, and it continues to have great potential for the future even though it has developed more slowly than early predictions. The U.S. Atomic Energy Commission (AEC) has predicted that electricity generated by nuclear power will rise from the present 4% to an impressive 60% of the total electrical supply in the United States by the end of the century. The world's supply of uranium has not been accurately determined, but with improving technology it should be adequate for many centuries. W. Bennet Lewis of the AEC has commented about Canada's CANDU heavy water reactor; "As long as the world population growth can be checked, so that population does not exceed 15 billion, CANDU reactors alone promise for many thousands of years plenty of energy for food, water, clean air and comfort for man and his environment.

SUMMARY

There is no precise measure of the world's ultimate energy resources, nor is there ever likely to be one. The development of new technologies continually adds to our ability to convert varied forms of resources into useful energy. This precludes any finite assessment of all the resources which should be counted in this planet's "inventory" of energy reserves.

CHAPTER 4: THE U.S. ENERGY POSITION

The United States faces a rapidly growing demand for energy and a short-term shortage of domestic supplies. Although the U.S. has several domestic potential alternatives to oil and gas these will not be fully developed for some years because of the time required to perfect the technologies involved. Until these alternative sources can supply energy in large quantities and at competitive prices, the U.S. must rely heavily on conventional oil and gas. Much of this will come from U.S. known and potential reserves, but there will be a very substantial and growing need for imported oil and gas supplies, for at least two decades.

U.S. Domestic Petroleum Reserves

Crude oil reserves in the 48 mainland states are estimated at about 35-billion barrels. These would supply the U.S. demand for only 9 years at the current rate of consumption. The Alaskan reserves add another 10 billion barrels, but these will not be available until transportation systems are built to deliver them to market.

Remaining U.S. natural gas reserves are estimated at about 250 trillion cubic feet. At the current consumption rate these would last 11 years. However, the demand for gas is growing at close to 5% annually and if this trend should continue the existing supplies would last only about 8 years.

There is still considerable potential for the addition of new oil and gas reserves in the U.S. The U.S. National Petroleum Council estimates that a potential exists for an additional 385 billion barrels of oil. This is equal to 90% of the oil reserves which have already been discovered in the U.S. (425 billion barrels). The potential for new gas reserves is over 1,000 trillion cubic feet -- more than twice the volume found to date. The concerted exploration and research effort required to prove these potential reserves can only be encouraged and sustained by favourable attitudes on the part of government, industry and the public.

Alternatives to Oil & Gas

There is a bill before Congress which would appropriate \$20 billion for energy research, including intensive investigation of alternatives to oil and gas, such as gasification of coal, recovery of hydrocarbons from shale deposits, development of new nuclear generation methods and the tapping of hot springs to power geothermal generating stations.

Coal reserves in the United States are enormous -- up to 3.2 trillion tons according to the U.S. Geological Survey. Of this total, 150 billion tons are known to exist in formations that can be mined by current methods.

There are 1.8 trillion barrels of oil locked up in shales in the United States, and some portion of these may prove economically recoverable in this decade.

Uranium reserves in the United States are able to sustain the nation's requirements for many decades even with present technology. Development of breeder reactors will extend these supplies even longer, giving the uranium reserves something like 50 times their present potential. \$500 million will be spent to develop a commercial-sized fast breeder reactor. In addition, the U.S. is spending \$40 million on research of the hydrogen fusion reactor, which is also a potential electric power generator. The fusion reaction will likely be achieved, but commercial development may take as long as 20 years.

While it is clear that the United States is not short of alternative energy resources over the long term, research and development of these resources will take time. In spite of the options being pursued, the United States will be dependent on oil and gas well beyond 1985 and, to a large degree, even beyond this century.

President's Energy Message

In his energy message to Congress April 18, 1973, U.S. President Richard Nixon declared "We are in a period of transition, in which we must work to avoid or at least minimize short-term supply shortages, while we act to expand and develop our domestic supplies in order to meet long-term energy demands."

In order to help meet the United States' short-term energy needs, the President removed all direct tariffs and quotas from imported crude oil. These controls will be replaced by import license fees which will be increased in stages during the next few years. This policy is intended to make imported crude more attractive to U.S. refineries in the short term.

CHAPTER 6: THE CANADIAN ENERGY POSITION

To encourage domestic exploration for oil and gas to meet longer term needs the President proposed that tax incentives for exploratory drilling be increased and that federal price restrictions on interstate gas sales be relaxed. He announced two moves to expand the amount of land available for exploration. One move will triple the annual acreage leased to oil companies on the outer continental shelf by 1979. The second move will establish a long-term leasing program for all energy resources on public lands. In addition, he urged that highest priority be given to expanded development of coal resources; that the U.S. avoid any further unreasonable delays in developing nuclear power; and that leasing programs for shale oil recovery and geothermal power development proceed if studies nearing completion show the environmental risks are acceptable.

These initiatives are very significant for Canada. The President's energy message recognizes that the development of energy resources for the United States must be encouraged across a broad economic and technological front. It signals to Canada and other nations that the U.S. is prepared to come to grips with the problem and make the necessary social and economic compromises to achieve solutions. This development indicates that those potential energy exporters who choose to wait for some future time to capitalize on the opportunities presented by the present situation in the U.S. may find that these opportunities have passed them by.

CHAPTER 6: THE CANADIAN ENERGY POSITION

Canada is in a unique position for a developed nation because we have a potential abundance of energy resources. However, these resources can only be made available for future use by Canada if they are developed on an orderly and timely basis. Low-cost Western Basin reserves of conventional oil and gas are being used at a rate faster than the Western Basin reserves are being extended. As we look at the future, we can see that the tar sands as well as frontier oil and gas will be required for Canadian consumption. We can also see that in order to achieve development of these reserves at an economical cost per barrel, export markets may be required to provide the initial volumes which will bring about economies of scale.

NATIONAL OIL POLICY

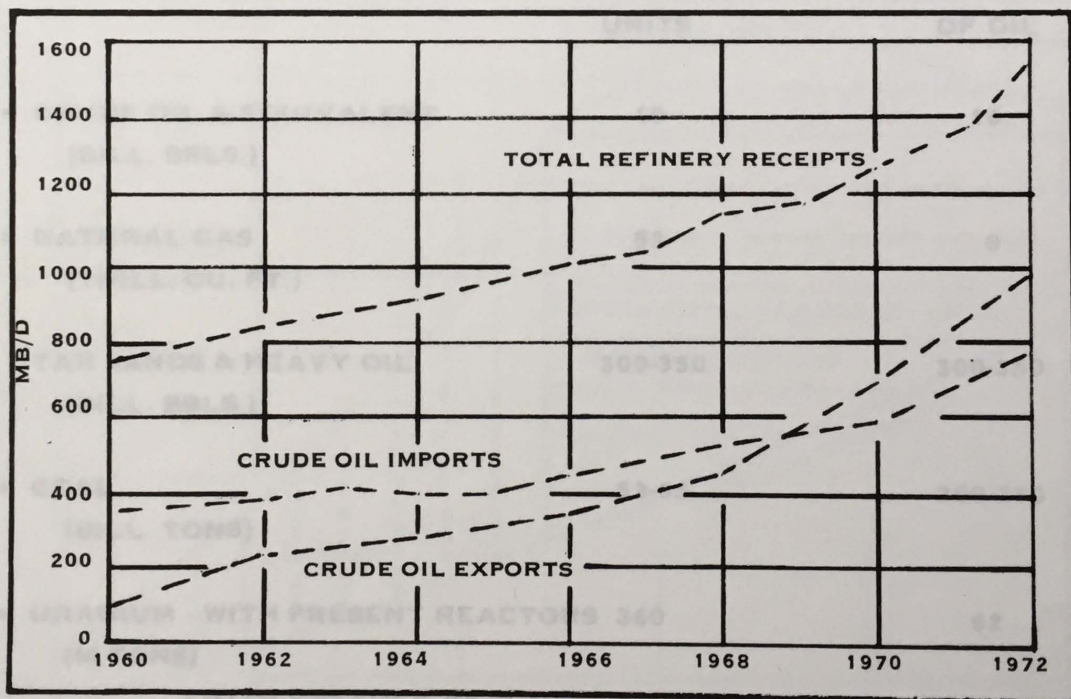
Since the discovery of large supplies of petroleum in Canada in the late 1940's, consistent government policy has been to encourage the development and marketing of oil and gas in the manner which provides the greatest economic benefits to Canadians. One of the means to achieve this has been the National Oil Policy, which establishes the "Ottawa Valley Line" separating the Ontario and Western Canada markets -- served overland by domestic supplies, from the Quebec and Atlantic Provinces markets -- served by foreign oil supplies. This geographical segregation of domestic markets has provided Canada with the opportunity to develop a viable oil producing industry, including an important export component which currently gives Canada a favourable crude oil trade balance.

IMPORTS & EXPORTS

Exports of oil from Western Canada were 950,000 barrels per day in 1972, while imports to Eastern Canada were 787,000 barrels, giving the country a net export position of 163,000 barrels per day. This represented about 11% of Canada's refinery production. Since relaxation of U.S. import quotas, the Canadian export figure is running about 1.2 million barrels per day.

FIGURE 7

CANADIAN CRUDE OIL IMPORTS & EXPORTS



• DOES NOT INCLUDE POTENTIAL RESERVES

Development of these energy reserves will depend to a considerable degree upon economic factors. For example, without price levels which place a value on oil and gas reserves sufficient to justify their development, these reserves will remain as potential but unusable resources.

SUPPLY & DEMAND

Proven reserves of oil and gas are about as high as they have ever been in Canada and the potential for discovery of new reserves is excellent, as indicated by the presence of hydrocarbons both in the Arctic and offshore east coast. These conventional petroleum reserves are backed up by the Athabasca tar sands, which are the largest known single accumulation of oil reserves in the world, and by heavy oil deposits such as those at Cold Lake. These synthetic sources add hundreds of billions of barrels to our reserves. Canada is also rich in mineable coal deposits and reserves of uranium.

FIGURE 8

CANADA'S EXISTING ENERGY RESERVES

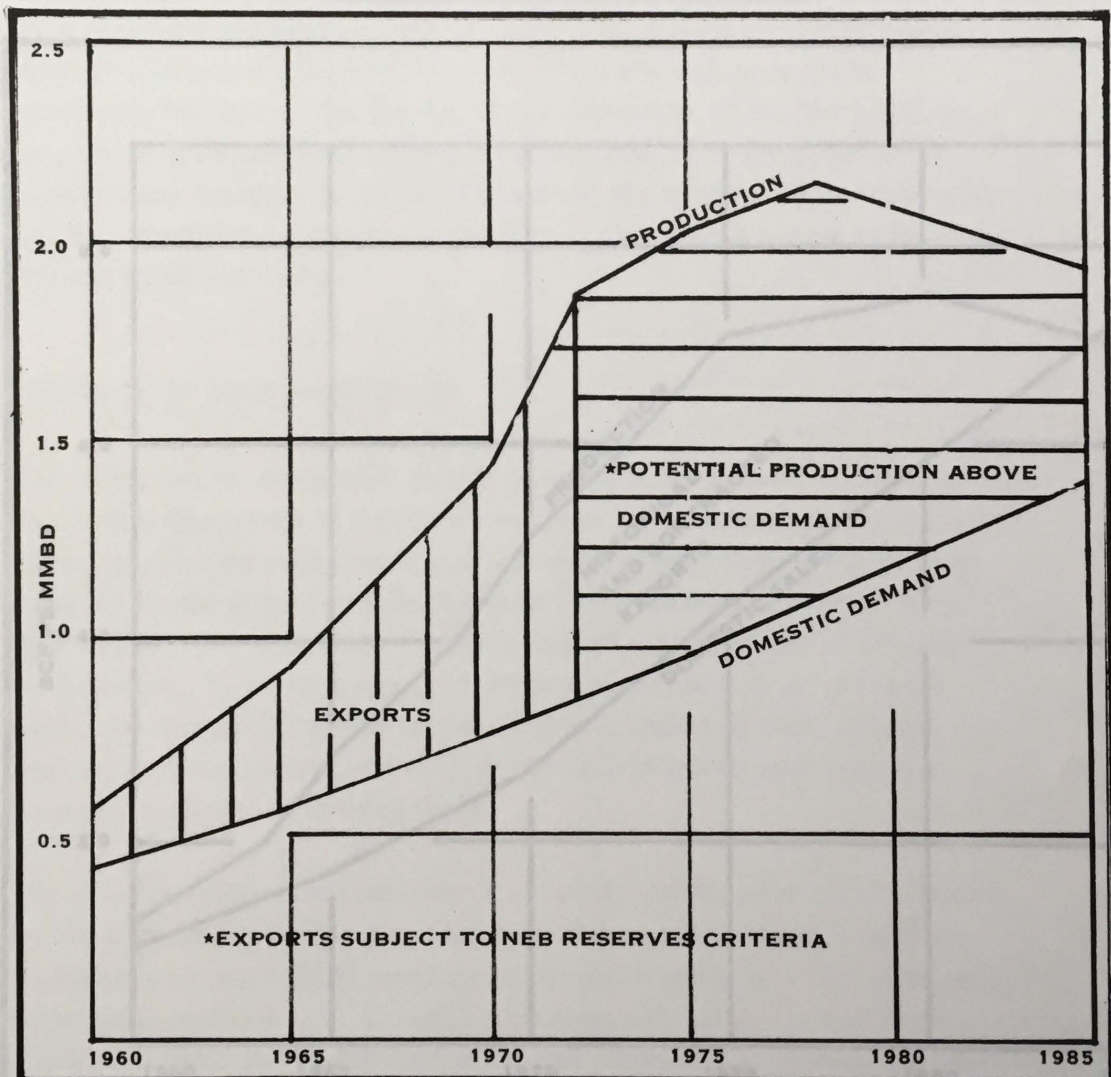
	NATURAL UNITS	THERMAL EQUIV. IN BILL. BBLs. OF OIL
* CRUDE OIL & EQUIVALENT (BILL. BBLs.)	10	10
* NATURAL GAS (TRILL. CU. FT.)	53	9
TAR SANDS & HEAVY OIL (BILL. BBLs.)	300-350	300-350
* COAL (BILL. TONS)	53-65	200-250
* URANIUM - WITH PRESENT REACTORS 360 (M TONS)		62
- WITH BREEDER REACTORS 360		3,400
* DOES NOT INCLUDE POTENTIAL RESERVES		

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Western Basin Oil Reserves

Canada's reserves of conventional crude oil and crude equivalents have remained fairly level in recent years at 10 billion barrels in the relatively well explored western sedimentary basin. However, additions of new crude oil reserves have not quite kept pace with increases in production rates. The following chart (Figure 9) indicates that by 1977 or 1978, western Canada will be capable of producing at a peak rate of 2.2 million barrels per day. This is 300 thousand barrels higher than the current 1.9 million. Here again, it should be noted that demand and supply projections are based on assumptions about variables such as markets, discovery rates and price effects.

FIGURE 9
PROJECTED WESTERN BASIN OIL

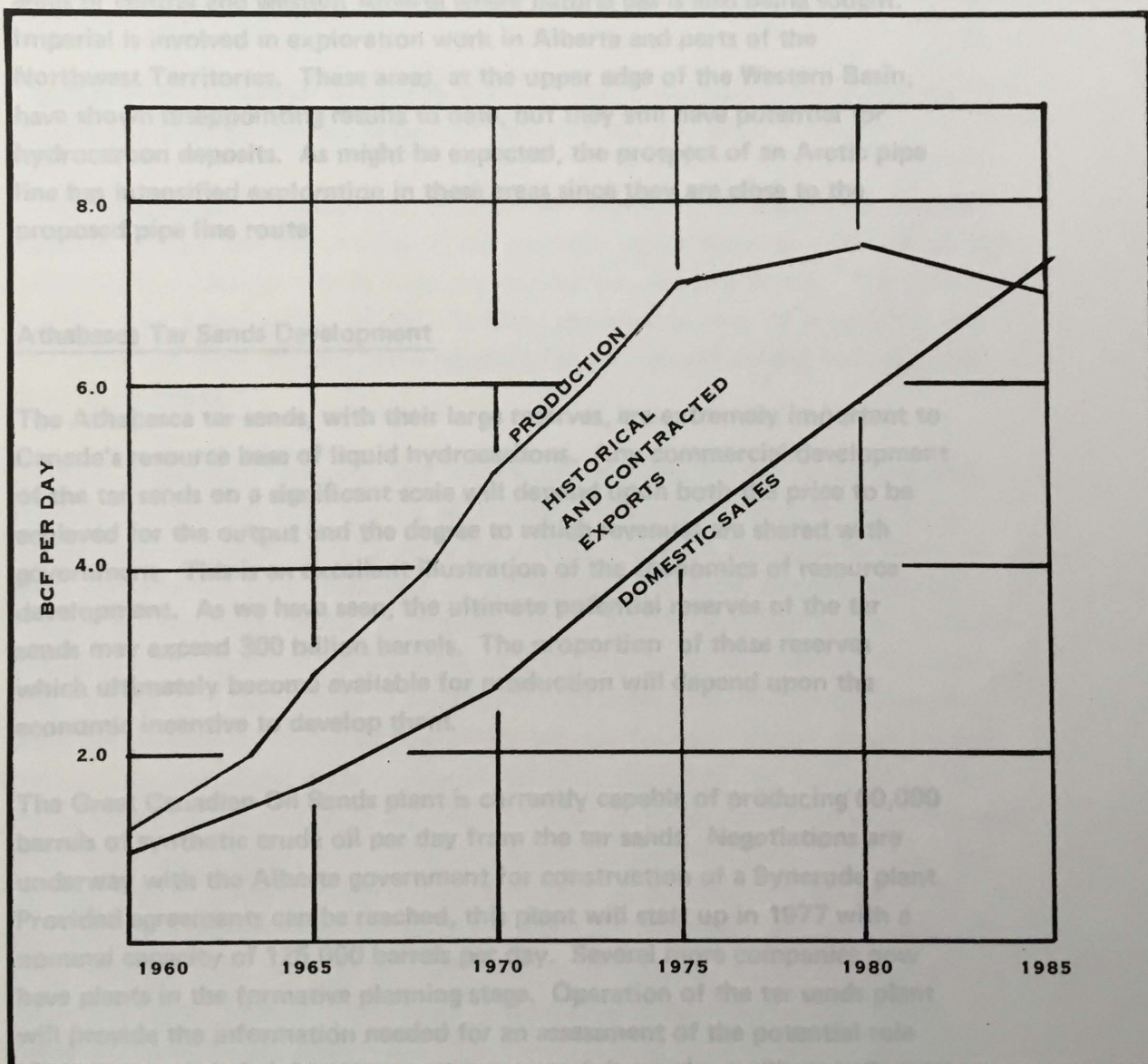


After the Western Basin reaches this peak production rate about 1978, its rate will decline, even though production will continue for another 20 to 30 years. After 1980, this basin will not be able to meet the demands of increased Canadian consumption and maintenance of exports at their present level.

Western Basin Gas Reserves

The natural gas reserves in the Western Basin are estimated at 62 trillion cubic feet. Current production rate is 6 billion cubic feet per day, including contracted long term exports of 2.7 billion cubic feet per day. These reserves will supply domestic demand and current export volumes until about 1980, when the growth in the domestic market plus exports will overtake their capability to meet demand. After 1980, the production rate for these Western Basin gas reserves will level off, even making allowance for estimated new discoveries.

FIGURE 10
PROJECTED WESTERN BASIN GAS



EXPLORATION & DEVELOPMENT

Since production of both oil and gas from known Western Basin reserves will be declining after 1980, while demand will continue to grow, it is obvious that discovery and development of new reserves is necessary. Activities aimed at supplementing the known reserves include further exploration of the Western Basin, development of the Athabasca tar sands and exploration of frontier areas -- the Arctic and the eastern continental shelf.

Western Basin Exploration

Exploration activity continues in the Western Basin. Most of this activity is in eastern Alberta where shallow gas is the drilling target and in deep basin areas of central and western Alberta where natural gas is also being sought. Imperial is involved in exploration work in Alberta and parts of the Northwest Territories. These areas, at the upper edge of the Western Basin, have shown disappointing results to date, but they still have potential for hydrocarbon deposits. As might be expected, the prospect of an Arctic pipe line has intensified exploration in these areas since they are close to the proposed pipe line route.

Athabasca Tar Sands Development

The Athabasca tar sands, with their large reserves, are extremely important to Canada's resource base of liquid hydrocarbons. Any commercial development of the tar sands on a significant scale will depend upon both the price to be achieved for the output and the degree to which revenues are shared with government. This is an excellent illustration of the economics of resource development. As we have seen, the ultimate potential reserves of the tar sands may exceed 300 billion barrels. The proportion of these reserves which ultimately become available for production will depend upon the economic incentive to develop them.

The Great Canadian Oil Sands plant is currently capable of producing 60,000 barrels of synthetic crude oil per day from the tar sands. Negotiations are underway with the Alberta government for construction of a Syncrude plant. Provided agreements can be reached, this plant will start up in 1977 with a nominal capacity of 125,000 barrels per day. Several more companies now have plants in the formative planning stage. Operation of the tar sands plant will provide the information needed for an assessment of the potential role of the tar sands in helping to meet the excess of demand over Western Basin conventional oil supply after 1980.

Arctic Exploration & Development

The high cost of Arctic development and transportation systems requires large reserves and high flow rates for these resources to be marketed at competitive unit costs. The reserves needed for a mainland oil pipe line have been estimated at about 2 billion barrels, while those needed for a gas pipe line are a minimum of 15 trillion cubic feet. If Canadian reserves were to be "piggy-backed" with Alaskan reserves, the figures would be lower. However, the growth in the Canadian domestic energy market is not sufficient in itself to maintain a minimum economic flow rate of Arctic oil and gas. Arctic reserves can be developed at a price attractive to Canadian consumers only by including an export component to reduce unit costs. Alternatives to pipe lines, such as a railway or the fleet of massive resource-carrying airplanes proposed for study by the Great Plains Project, would similarly require large volumes to justify capital and operating expenditures. At this time, pipe lines appear to be the most economical and practical transportation system.

The Advisory Committee on Energy to the Ontario Government recognized the importance of these reserves to Canada's domestic supply when it stated:

"There is no doubt these frontier resources will eventually be needed for Canada's markets. Proven reserves of both oil and gas from conventional sources will not be sufficient to sustain growth in domestic demand beyond this decade. Thereafter, frontier production will be needed. But first the reserves must be established and this cannot be done without heavy expenditure on exploration and development in the near future."

In 1964, conscious of the long lead times involved in finding and developing new reserves, and anticipating a market opportunity, Imperial successfully bid for exploration permits to hunt for oil in the Arctic, where the potential for new finds appeared the most promising. It is interesting that some of our successful acreage had been abandoned. Approximately 10 million acres was held by Imperial in exploration permits in the Beaufort area, another 1 million in the Arctic islands and Imperial is in the process of earning 600 thousand acres of Panarctic land by work commitments. About twelve drilling rigs and fourteen seismic crews are now active in the Arctic and there have been 125 holes drilled to mid 1973, 64 of them in the Arctic islands and 61 in the Beaufort area. Imperial has drilled or participated in 44 exploratory holes, all but four of them in the Beaufort area. Four more are drilling. So far, Imperial alone has made three oil discoveries and two gas finds, and we have participated in two gas finds with Gulf and Shell. Wholly owned gas finds have also been reported by Gulf, Shell and Panarctic. According to one published report, Panarctic is thought to have located an estimated 15 trillion cubic feet in its 11 gas wells.

CHAPTER 7: THE CASE FOR ARCTIC DEVELOPMENT

Moving these gas reserves from the Beaufort area and Alaska to Canadian and United States markets will be the function of the 3,000 mile, 48-inch gas pipe line that has been proposed by Canadian Arctic Gas Study Limited, a 26-company consortium. Imperial is a member company of the consortium which has been established to share the costs of an Arctic pipe line study. It is expected that application will be made during 1973 to the Department of Indian Affairs and Northern Development and to the National Energy Board for permits to build the line and export a portion of the reserves.

IMPERIAL'S POSITION

East Coast Exploration

On the eastern continental shelf, the potential for large hydrocarbon deposits has resulted in exploration permits being issued covering several hundred million acres. Four semi-submersible rigs are drilling prospects on the Grand Banks and on the Scotia Shelf. Two of these rigs are operating on 37 million acres of the Grand Banks held jointly by Imperial and Amoco. Imperial has farmed out 1/3 of its interest in this acreage to Chevron and Skelly, who will assume Imperial's share of the cost of the drilling program over the next two years. Seventeen holes have been drilled on this acreage to mid 1973 and the program will continue through 1974. On the Scotia Shelf, 44 holes have been drilled, mainly by Shell and Mobil Oil. Results to date include two gas discoveries, a marginal oil well and several gas shows. Two attempts on the Labrador shelf were unsuccessful. In addition to its one-third net interest in the Grand Banks acreage, Imperial holds 46 million acres in deeper water (over 3,000 feet) and seismic surveys are currently under way to evaluate prospects. Drilling in this depth of water will require new techniques which are only now being developed.

The potential for additional oil and gas reserves in Canada's frontier areas is good. The Canadian Society of Petroleum Geologists estimates that in all of Canada's frontier areas, there is a 50% probability of finding 44 billion barrels of oil and 215 trillion cubic feet of gas. There is a 90% probability of finding 8 billion barrels of oil and 38 trillion cubic feet of gas.

The following chapters provide a distillation of Imperial Oil's position on the six issues raised in Chapter 1, with rationale based largely upon the information already covered.

CHAPTER 7: THE CASE FOR ARCTIC DEVELOPMENT

The issue has been described as:

1. *The advisability of developing Arctic reserves at this time is questioned because alternative sources of supply seem to be available to meet Canadian needs.*

IMPERIAL'S POSITION

The Arctic gas resources should be developed. Western Basin reserves are not expected to be able to sustain the growth rate in Canada's demand much beyond this decade. Although Canada has ample supplies of potential energy in various forms for the longer term, the real danger is that we could face a shortage of low cost conventional energy in the next 10 to 15 years unless frontier resources are developed in timely order.

Development of new energy supplies can not be left until the shortage is at hand; long lead times and large sums of money are needed to explore and develop in hostile and costly environments. Imperial made commitments in the Arctic in 1964 -- fully recognizing the minimum requirements of 8 to 10 years for primary exploration and several more years to bring any discovered reserves into production.

While the mainland Arctic is currently the most promising area to relieve Canada's projected shortage after 1980 because it represents the most favourable combination of potential reserves and per-unit cost of development, activity must also continue in other areas such as the eastern continental shelf. Here, too, prospects for commercial development appear favourable. This is not to say that alternatives to conventional oil and gas should be neglected until some future time. Heavy oil deposits in Athabasca and Cold Lake are being developed. Nuclear and thermal generating capacity is being increased. Research into other energy forms must continue. Arctic petroleum development is only one part of a broad advancement in developing Canada's energy supplies for the future. But if the Arctic reserves are not explored and developed now, the events of time may pass us by and this valuable resource may never be brought to use, as Canada and other countries turn to new energy sources.

CHAPTER 8: THE CASE FOR EXPORTING

The issue has been described as:

2. *The advisability of exporting Canadian oil and gas is questioned because the U.S. experience seems to pose a warning that we, too, may eventually run short of energy supplies for our own use.*

IMPERIAL'S POSITION

The assumption that energy shortages similar to those experienced in the U.S. will inevitably occur in Canada overlooks this country's demand/supply differences and the role of the National Energy Board. Canada's exports of oil and gas are controlled by the National Energy Board with the purpose of ensuring that supplies are adequate for future Canadian needs. It should also be pointed out that Canadian oil and gas supplies are not by any means a solution to the U.S. problem. In 1972, for instance, exports of Canadian oil and gas to the U.S. represented only 6% and 4%, respectively, of the U.S. total demand.

The continuing export of oil and gas will naturally depend on our success in finding new supplies which are surplus to our own future needs. But without export volumes -- at least initially -- Arctic development is not possible because of the size of the facilities needed to recover and market these reserves economically. Success on the east coast will reduce our dependence on imported crude oil east of the Ottawa Valley and perhaps provide further opportunities to export oil surpluses to U.S. markets. Gas discoveries on the east coast would provide supplies previously unavailable to the Atlantic provinces, and surpluses to the eastern Canadian requirements could be exported.

ALTERNATIVES TO EXPORTING OIL

Two of the reasons advanced by those who suggest Canada should halt exports of oil are conservation and security of supply. The argument in favour of conservation is that by halting exports and cutting back on production, we can extend the life of our reserves for Canada's own future domestic use -- or delay development until a time of higher export prices. The argument in favour of security of supply is that by redirecting oil from export markets to the eastern Canadian market, we can assure the security of supply for our total domestic market. These two proposals are mutually exclusive, and therefore each must be examined independently. Both would have serious economic consequences. Both would likely have serious political effects, with implications to international relations and trade.

Alternative No. 1: Cut-Back Production

The proposal that we end exports while continuing to import oil east of the Ottawa Valley Line would increase the life expectancy of our proven reserves for domestic consumption by only a few years -- probably less than 5. But it would result in a substantial reduction in the incentive to develop new reserves. This proposal would mean we could not attract the necessary capital for exploration of frontier reserves, and development of the tar sands and heavy oil deposits. If the time is too distant when the returns for risk investment can be realized, the investor will look elsewhere.

It is suggested by some that by delaying development of our energy reserves for export, we will find some time in the future when they are worth more. This proposal ignores the fact that the value of these reserves is affected by the availability and price of alternative resources. Waiting for higher prices may see the development of alternatives which render our frontier resources obsolete. Even if these alternatives should not be developed, any higher prices obtained for future exports would likely be offset by the inflation which may occur while we wait. Such inflation would also increase cost of development.

Alternative No. 2: Supply Western Oil to East

The proposal to insulate Canada from any dependence on imports would require that Quebec and the Atlantic Provinces use Western crude at least until sufficiently large reserves should be found and developed on the eastern continental shelf. It is true that proven Western reserves may be adequate to make us self-sufficient in the short term, although they would not sustain both eastern Canada's demand and export markets together. However, supplying western Canadian oil to eastern Canada would cause significant economic problems:

If imported crude remained an alternative to Western Canadian oil, the laid-down price for Western crude in Quebec and Atlantic refineries would have to compete with prevailing import prices. But because a considerable amount of this laid-down price would represent transportation costs, this situation would result in lower wellhead prices and therefore lower revenues to the Western producing provinces and producing companies. At these lower wellhead prices, it would probably not be economical to develop the Arctic reserves and the Athabasca and Cold Lake hydrocarbon deposits and this would eventually result in supply shortages.

If import controls should be placed on foreign oil to protect the prevailing wellhead prices in Western Canada, then those wellhead prices plus pipe line tariffs would make Western oil more costly to eastern consumers than alternative energy sources. The consumers of Quebec and the Atlantic provinces would be paying a premium to assure those regions security of supply.

The enormous cost of building transportation facilities is another drawback to this proposal. Additional pipe line would be needed from Montreal back to Manitoba, and this would require hundreds of millions of dollars in additional investment and operating cost. Because of producing limitations, export markets would be shut off in favour of more distant and costly domestic markets. The cost to the economy of such a re-ordering would be great -- and discoveries of oil off the east coast of Canada would make the investment worthless.

CHAPTER 9: POTENTIAL ECONOMIC IMPACTS OF ARCTIC DEVELOPMENT

GAS EXPORTS

In 1971, NEB turned down requests from several gas pipe line companies for additional exports to the United States. But while the Board ruled there was not sufficient surplus then available to permit increased exports, it noted: "The Board would also hope that the rejection of these export applications would be read by the producers as an indication of the need to find much greater reserves of gas in Canada, reserves in amounts that would keep pace with the recent upswing in requirements, and it is to be hoped, make available surpluses which would enable producers and Canada as a whole to benefit further from future export opportunities."

At the time the Board made that statement, Arctic gas reserves were not considered. These potential reserves promise to take care of the deficit noted by the NEB and also to create the new export opportunities which the Board recognized as desirable for the Canadian economy.

SUMMARY

Imperial Oil believes it is not reasonable to suggest that Canada should live in isolation and husband her reserves while an export market opportunity exists for resources which are surplus to domestic requirements. As our Chairman of the Board Mr. W.O. Twaits recently stated:

"If we do not develop export markets on a scale which will permit development of frontier areas, we will, in effect, not just be denying an export opportunity but possibly creating a future supply problem requiring imports."

.....

Capital Availability
"Delay in development of these reserves means that our potential customers must look to other sources of energy and, as experience has demonstrated time and again, once these markets are lost, they are not easily regained -- if ever."

CHAPTER 9: POTENTIAL ECONOMIC IMPACTS OF ARCTIC DEVELOPMENT

The issue has been described as:

3. *The possible economic impacts of such development are coming under scrutiny including:*

- *the effects on the amount of capital available for expansion of secondary manufacturing industries if large amounts of additional capital are invested in primary resource development;*
- *the long term employment contributions of "capital-intensive" resource development projects;*
- *effects on the exchange rate of the Canadian dollar as a result of large imports of capital and subsequent large exports of oil and gas;*
- *the degree of participation by Canadian suppliers and workers in large energy development projects.*

IMPERIAL'S POSITION

Little research has been done in Canada on the economic contribution of the resource industries. Steps are now being taken to remedy this deficiency. These include the use of input-output tables compiled by Statistics Canada which help to determine how transactions flow between various industries and mathematical models of the economy which calculate the effects of changing the variable influences.

This chapter deals specifically with the possible effects of Arctic development on capital availability for secondary manufacturing, on the dollar exchange rate and on employment, along with implications for Canadian content in the proposed gas pipe line.

Capital Availability

During the past two decades, the petroleum industry has made capital expenditures on producing facilities, transportation systems and refineries at a rate equivalent to about 2% of the Gross National Product. Assuming exploration success in the frontier areas, total spending by the industry is expected to rise to just about 2.4% of the GNP projected by the Economic Council of Canada. This means that there will not be any massive "diversion" of available capital away from the manufacturing sector. The above projections indicate that the capital spending by the petroleum industry will not be a significantly greater factor in the Canadian economy than it has been in the past.

Employment Impact

At the University of Toronto, a study has been completed which analyses the relationship of the resource industries with the rest of the economy and their role in creating employment. Tentative results suggest that when all the multiplying effects of resource development are taken into account, the employment effects of capital spending in primary resource production are about the same as the effects of capital spending in secondary industry. Suppliers of material and services to the petroleum industry number about 1,800 companies including steel mills, engine builders, construction firms and many more. While the resource industries are capital intensive, these supportive industries are both capital and labour intensive. To achieve a clear understanding of the employment effects of resource industries, it is necessary to examine the total system, rather than isolate the direct employment. Mr. Ronald S. Ritchie, Senior Vice-President and Director of Imperial Oil pointed out in a recent speech:

"Capital in the form of plant and equipment is itself a form of labour -- labour that has been done before the capital is put to work. It requires additional labour for maintenance and replacement. The supportive industries, all of them also employing labour, tend to be large in total and widely dispersed through the economy."

In its report on Natural Resources Policy Issues in Canada, the Science Council of Canada took note of this multiplier effect. It stated:

"In general, it may be concluded that, despite the wide variation in labour intensity in one industry to another for a given increase in input, no single industry or group of industries can be characterized as having a significantly higher impact on national employment (assuming wages and salaries and earned income are representative of employment)" ----- "In other words, we might expect roughly the same increase in the number of jobs throughout Canada from stimulating a given increase in production in the metal *extraction* industry as in *any* of the manufacturing industries." (Italics by I.O.L.)

While direct employment on the pipe line will, indeed reach a temporary peak much higher than the long-term direct employment, it should by no means be overlooked. CAGSL has estimated peak employment at about 7,000 -- with nearly 600 being employed later in operation of the completed pipe line. Seldom has a pipe line been built without later expansion of "looping" of at least some portion of it, thus providing a degree of continuity to the construction program and its employment effects.

Exchange Rate Impact

It has been suggested that importing large amounts of capital will tend to increase the value of the Canadian dollar, making it more difficult for exporters of Canadian goods to compete in world markets. This argument overlooks the fact that imported capital is only one factor influencing the exchange rate. The value of a currency depends on the interaction of a complex set of economic forces, besides the movement of capital.

As an illustration of this -- the United States had a strong and under-valued currency for several years while it was a substantial exporter of capital, and more recently, the U.S. has had a weak and over-valued currency while continuing to be a substantial capital exporter. Fiscal and monetary policies have more influence on exchange rates than do the international movements of capital, and the self-correcting effects of the domestic and international monetary system tend to maintain the exchange rate of any currency at its real value.

In any case, the projected capital imports for the Arctic gas pipe line will be spread over a three year period of construction. Some foreign-made goods and labour will certainly be used, and these will serve to offset the effects of importing capital. As the wealth generated by the pipe line expenditures and subsequent sale of gas spreads through the Canadian economy, Canadians will spend some of it on foreign goods, which will add to capital outflows. Induced effects throughout the economy such as these, provide adjustments to any temporary distortion in currency values.

Preliminary results from studies undertaken for Canadian Arctic Gas Study Limited at the University of Toronto (using its TRACE economic model) indicate that there need not be upward pressure on the Canadian dollar from the financing and construction of the pipe line. Imported capital for financing and construction is likely to be at least matched by direct and induced payments for foreign goods and services. Impacts on price levels and interest costs should be negligible.

CHAPTER 12: THE MULTINATIONAL CORPORATION ISSUE

Canadian Content Implications

Canadian sources of supplies and labour will be used to a very large extent in construction of the proposed pipe line, gas plants, gathering systems and other installations. One of the federal government guidelines is that the pipe line project should make the maximum possible use of Canadian skills in all facets of the operation.

The dimensions of this project provide the opportunity for it to be a larger employer of Canadian skills and material than any other single project ever undertaken in this country. However, it will be necessary to import some of the specialized skills, and materials required where insufficient capability exists in Canada within these specialties.

More information regarding the various economic impacts of pipe line construction will come from studies undertaken at the request of Canadian Arctic Gas Study Limited. It has been estimated that operation of the pipe line would stimulate \$1.3 billion annually in economic activity -- a substantial contribution to real economic growth and improved living standards.

Another measure of the contribution of international oil companies to the Canadian economy can be taken from an analysis of the distribution of revenue from increased crude oil prices. The following table assumes a company whose equity is 75 percent foreign-owned and which retains 50% of its earnings. The typical government revenue rates used in the example are 20% provincial royalties and 33% effective tax rate after depletion allowance.

CHAPTER 10: THE MULTINATIONAL CORPORATION ISSUE

The issue has been described as:

4. *There is a belief among some people that foreign-owned multinational corporations export an undue amount of profits in relation to the economic benefits they generate for a country, and that government regulation of Arctic development is too favourable to these companies.*

IMPERIAL'S POSITION

Imperial Oil Limited creates many times more wealth in Canada than it exports to non-residents of Canada. This can partially be measured by the economic tool of "value-added" -- which is the balance of the selling price of all goods produced less the cost of materials purchased from others. Gross National Product (GNP) is the value added by all productive enterprises in the economy. In 1972, Imperial Oil's value added was \$575 million. Of this, \$52 million (about 9%) left the country in the form of dividends to non-residents. The balance was paid to governments, employees and Canadian shareholders, or reinvested in the business.

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FIGURE 11

DISTRIBUTION OF REVENUE PER EACH \$1.00 INCREASE IN CRUDE OIL PRICES

INCREASED REVENUE	\$1.00	
ROYALTY	.20	
	.80	
INCOME TAXES	.27	
AFTER TAX PROFIT	.53	
RETAINED EARNINGS	.26	
		.27
		.18
		.09
DIVIDENDS	WITHHOLDING TAX	.02
	CANADIAN	.07

It can be seen that 82% of the \$1.00 increase remains in Canada, including government revenues of 49%, retained earnings for reinvestment of 26% and dividends of 7%.

CHAPTER 11: ENVIRONMENTAL PROTECTION

The entire resource industry in Canada is subject to stringent government control -- probably more than any other industry. Controls which are imposed on producing companies cover thorough environmental and safety precautions as well as leasing obligations and royalty provisions that ensure the return of substantial assets and revenues to the government in the form of proved leases, income taxes and royalty and rental payments. Pipe line companies in particular are strictly regulated. They must pass various tests of guarantees regarding their capitalization, markets and availability of supply before they are awarded a permit to construct. Following construction, their operations are subject to regulated tariffs and profits.

Whether the majority of capital for the proposed Arctic gas pipe line comes from within Canada or from foreign sources, the federal government will rule on how the pipe line is to be built and financed and it will exercise strong direction over operation from the environmental standpoint -- as it is presently doing during exploration. CAGSL feels that there will be no difficulty in raising 51% or more of the equity capital in Canada.

Finally, the National Energy Board will continue to determine the level of permissible exports, having first assured that future Canadian needs are properly protected. Indeed, all the questions explored in this background paper -- economic gain to Canada, Canadian long term energy needs, the export opportunity, environmental and social implications -- will be carefully analyzed and evaluated by government experts as a guide to the decision by the federal cabinet on the Arctic gas pipe line.

In summary, control is fully in the hands of Canadians and their government, regardless of the ownership of companies involved in resource development.

CHAPTER 11: ENVIRONMENTAL PROTECTION

The issue has been described as:

5. *There is a desire for assurance that environmental protection research, standards and techniques are adequate to minimize the effects of development on the Arctic's delicate ecological balance.*

IMPERIAL'S POSITION

Imperial has operated for more than 50 years in the Arctic and has gained valuable experience, so that we recognize the delicate balance in the Arctic environment. We are aware that design of facilities and environmental protection go hand in hand. We have developed and adapted many new techniques so that we can operate in harmony with this environment. These include many types of tracked and rubber-tired vehicles and other transportation equipment for land, air and sea; application of various kinds of insulation including styrofoam and wood chips to protect drilling sites; and many other developments. We have assisted government agencies in the preparation and development of guidelines and standards for Arctic transportation, exploration and construction activities. It would be unrealistic to suggest there will not be some disturbance of the environment, but with techniques now available -- many of them pioneered by Imperial -- assurances can be made that the resources can be developed and the gas pipe line built with a minimal and acceptable effect on the natural environment and wildlife resources of the north.

Canadian Arctic Gas Study Limited

CAGSL has spent some \$25 million on studies involving pipe line research, design and environmental protection. An additional \$10 million in research has been undertaken by the federal government.

One purpose of these studies is to assure that the permafrost will be maintained in its frozen condition so that the line will not sink, and that materials used in construction of the line will not break at low temperatures. The gas itself will be chilled below freezing and this will help to protect the permafrost.

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CHAPTER 12. EFFECTS ON THE NATIVE PEOPLE

The pipe line will be buried under gravel, and the surface soil will be restored and revegetated so that the line will be as inconspicuous as pipe lines elsewhere. Burying the pipe line protects it from animals and the animals are left unimpeded in their grazing, hunting and migrating activities. Extensive research is continuing into the possible effects of Arctic development on all plant and animal life and methods by which development can take place without unduly affecting the ecological balance.

Supplies will be moved and operations conducted while the ground is frozen so that damage will be minimized. Some disturbance is inevitable from these activities, but this will be rectified by backfilling and revegetating. It should be pointed out that of the 1.5 million square miles in the Northwest Territories, only 40 square miles will be included in the path of the line.

In summary, no project related to resource development has ever been subjected to such thorough and intensive environmental analysis on the part of business, government and the scientific community. Some disturbance of the environment will occur, but every possible technique will be used to minimize the effects.

CHAPTER 12: EFFECTS ON THE NATIVE PEOPLE

The issue has been described as:

6. *There is concern about the effects of Arctic resource development upon the economic and social patterns of northern native people.*

IMPERIAL'S POSITION

Economic & Social Effects

A process of irreversible change is occurring as many northern native people seek new social and economic objectives. Many northern people, the younger ones in particular, seek the benefits of a wage economy as an alternative to welfare or the traditional hunting-trapping lifestyle. The position adopted by Imperial is to offer the alternative of a wage economy to those who desire it and at the same time to operate in a manner which will not impair the opportunity for those who wish to pursue the traditional way of life. The development and marketing of northern reserves will not by itself solve the economic and social problems which are bound to emerge as change occurs. This development will, however, offer opportunities for employment and make a substantial contribution to increased income levels and living standards in the north.

Imperial has a good record in the employment and training of native workers. It is Imperial's policy to pay equal wages for equal skills, and training programs are being implemented so that natives may have the opportunity to undertake more than manual labour. The native work force along the route of the gas pipe line totals about 6,000 employable men. The most likely candidates among the native population for skilled supervisory jobs are the high school and technical graduates. Since these potential supervisors are just emerging from the schools, the involvement of natives in these jobs will be slow. In fact, one of the major concerns of government and educators is that young native men may not want to complete their education and become qualified as supervisors, when high-paying labouring jobs are readily available.

Aboriginal Rights

In recent years, the natives of the Northwest Territories and the Yukon have banded into groups such as the Indian Brotherhood and the National Eskimo Brotherhood. These groups claim entitlement to certain lands as their birthright. They do not universally oppose development, but feel that native peoples should share in oil and gas production royalties. In the United States, the federal government has agreed to provide Alaskan natives with payments of \$500 million over 12 years, a 2% royalty payment on production up to \$500 million, and full native title to 10 million acres. In Canada, legal aspects of native claims have not yet been resolved.

The resolution of aboriginal rights is the responsibility of the Canadian government and courts. Apart from the legalities involved, however, Imperial -- as one company with a commitment in the Arctic -- recognizes a moral obligation on the part of all companies in the north to provide the native people with as much opportunity for personal development as possible. Whether Indians and Eskimos wish to retain their traditional way of life or to opt for a wage economy, they should have the freedom to choose.

